

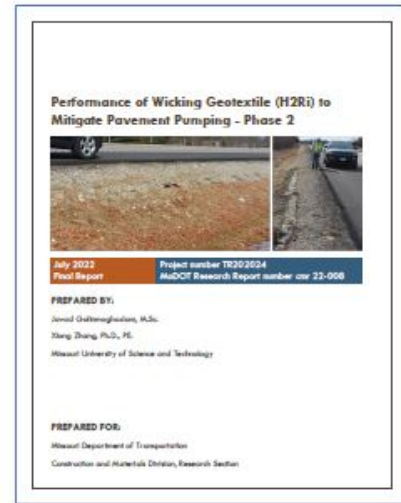
Research Summary

Performance of Wicking Geotextile (H2Ri) to Mitigate Pavement Pumping - Phase 2

Pumping is caused by the migration of fines from subgrade soils into upper granular layers under the action of moving traffic. This is one of the major factors contributing to concrete pavement failures, which reduces the pavement life, affects road safety, and increases maintenance costs. For pumping to occur, four basic conditions must exist: (1) A soil layer with a high amount of fines underlaying a granular layer having larger voids with no to little fines content, (2) soil that is saturated with free water, (3) repeated heavy axle loads that causes deflection of pavement and subsequently generates excess pore water pressure, and (4) presence of voids and cracks that form continuous paths to the road surface. Unfortunately, all four conditions are met in many pavement structures.

Existing methods that are used as drainage systems can drain gravitational (free) water under saturated conditions but not the capillary water under an unsaturated condition. The objective of this study is to explore and identify the feasibility of using a new wicking geotextile for pumping mitigation in pavement shoulder via laboratory tests and field test section monitoring.

Three test sections on the shoulder of I-44 in Missouri were constructed and instrumented. The construction of the field test section finished in



September 2018. In total, thirty-three moisture sensors were placed in the three test sections. Two of these sections were treated by placing the wicking geotextile between the clayey subgrade and the aggregate base in the road shoulder. A third section without wicking geotextile was used as a control for comparison with the geotextile sections.

“The wicking geotextile used in this experiment was found to be useful in draining water from subgrade soils under the pavement and reducing the risk of generating positive pore pressure that induces pumping.”

This report provides a summary of the initial report titled, “PERFORMANCE OF WICKING GEOTEXTILE ON MITIGATING WATER PUMPING ISSUE ON I-44 HIGHWAY”. Additionally, the results of monitoring the field test section for more than three years from September 2018 to December 2021 are discussed in this report. Results obtained from monitoring the field test section for more than three years verified the effectiveness of using wicking geotextile to reduce water content by up to 25% in the aggregate base. As a result, the reduced positive pore water pressure should delay the onset of pavement pumping.



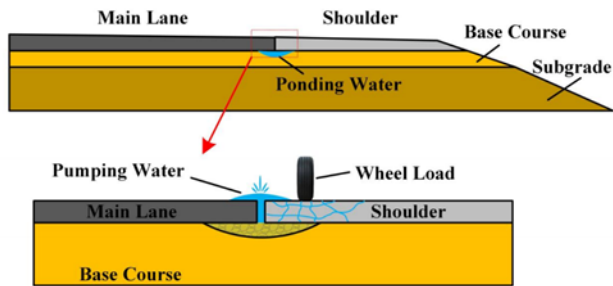


Figure 1: Schematics of pumping action.

Project Information

PROJECT NAME: TR202024—
Performance of Wicking Geotextile
(H2Ri) to Mitigate Pavement Pumping -
Phase 2

PROJECT START/END DATE: April 2020-
March 2022

PROJECT COST: \$49,916

LEAD CONTRACTOR: MCTI

PRINCIPAL INVESTIGATOR: Xiong Zhang

REPORT NAME: Performance of Wicking
Geotextile (H2Ri) to Mitigate Pavement
Pumping - Phase 2

REPORT NUMBER: cmr 22-008

REPORT DATE: July 2022

Project Manager



CONTACT INFORMATION:

Jennifer Harper
Research Director
Missouri Dept. of Transportation
1617 Missouri Blvd.
Jefferson City, MO 65109
(573) 526-3636
Jennifer.Harper@modot.mo.gov